

NASA Range Safety Program 2006 Annual Report

SPECIAL INTEREST ITEMS SUBMINIATURE FLIGHT SAFETY SYSTEM

A new technology currently under development is the subminiature flight safety system shown in the picture below. Concept development for this system began in May 2004 and was completed in September 2005. During this stage, requirements were developed, technology capabilities were derived, and approximate developmental costs were researched. A systems engineering analysis was also performed on the subminiature flight safety system during this time to improve and solidify feasible options and capabilities of the system.



Representative Discrete Components
6 lbs - 102 in³



SFSS
1.25 lbs - 10 in³

System Status

Phase I began in September 2005 after concept development was complete. This phase focused on developing and submitting Central Test and Evaluation Investment Program documentation to Tri-Service Representatives. All documentation and reports have been submitted for Phase I and, as of this publication, the subminiature flight safety system program is awaiting approval from Central Test and Evaluation for Phase II funding.

Phase II will include development of the system specifications and then a contract awarding process to build, test, and implement the subminiature flight safety system. This phase will also include qualification testing for components and eventual flight tests and demonstrations and most likely will reach completion in late 2009 or early 2010.

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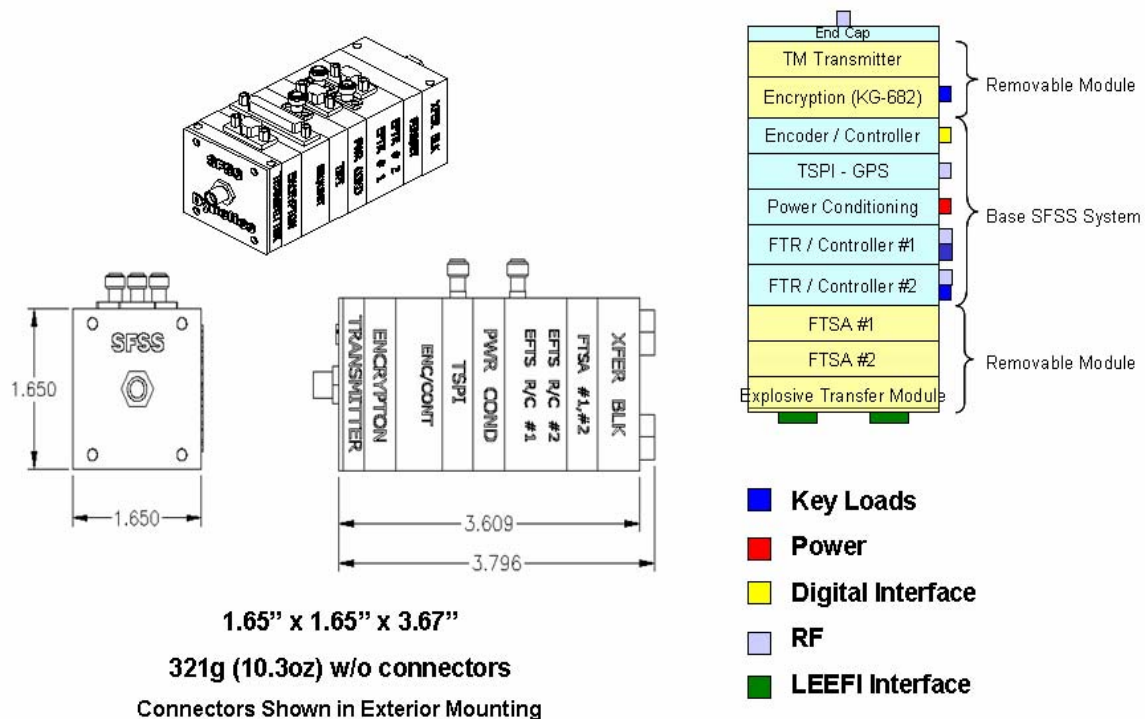
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Subminiature Flight Termination System Features

Some of the features and possible capabilities of the subminiature flight safety system are listed below and shown in the following diagram:

- Flexible, wide-range missile capabilities, such as air-to-air, surface-to-air, surface-to-surface, and air-to-ground
- Ability to operate without radar tracking infrastructure
- Low cost, less than \$35,000
- Telemetry capability for system health status (encrypted)
- Time and space information to provide accurate weapon system position (encrypted)
- Dual, redundant flight termination receivers/controllers
- Approximately 10 to 14 in³ in size
- Encoder and encryption capability
- Dual safe and arm controllers/inhibitors

The system also meets all [RCC 319, Flight Termination Systems Commonality Standard](#) requirements

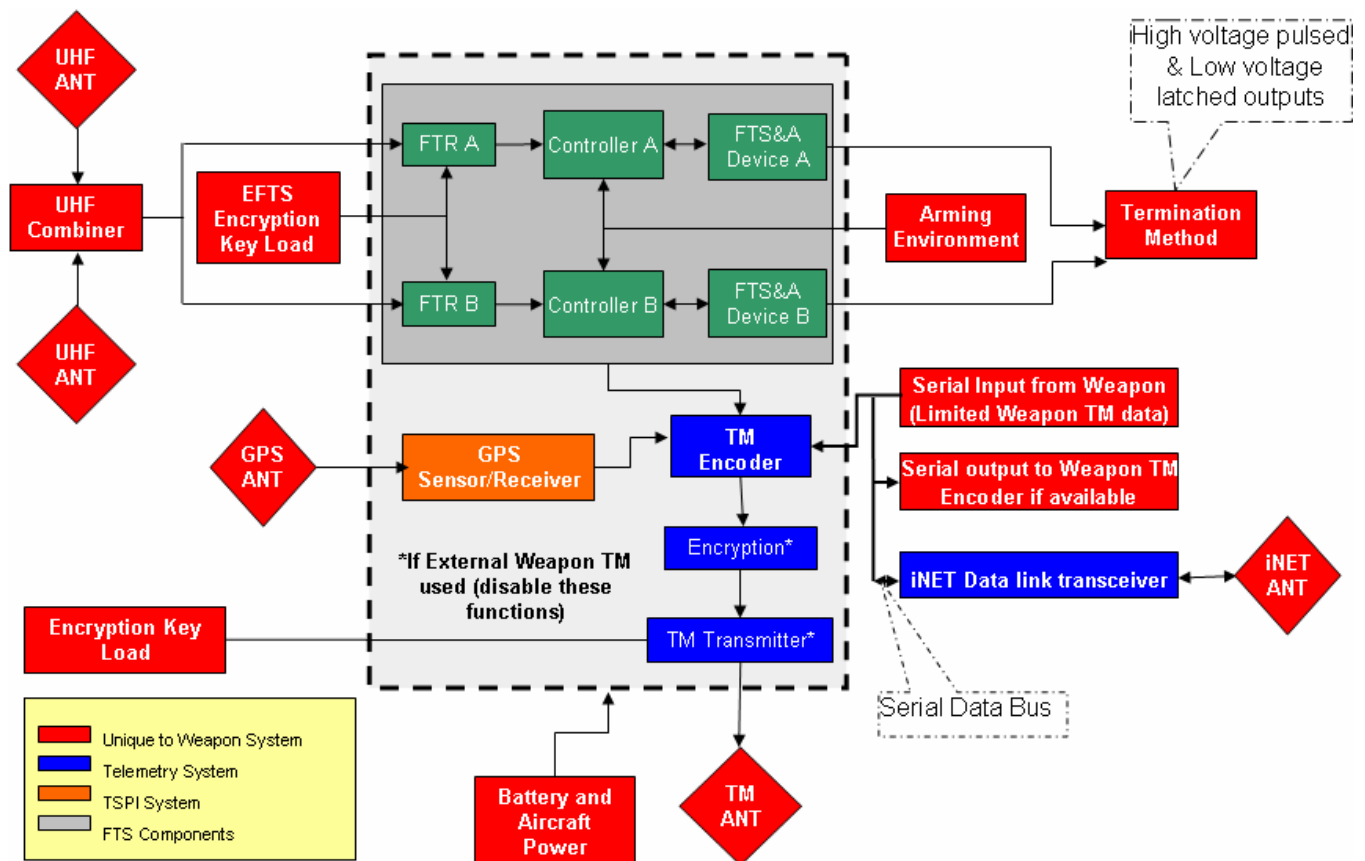


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Subminiature Flight Termination System Architecture

The subminiature flight termination system is being designed in a modular format to make several different options available. This format will make the unit more flexible to the needs of the user or program. For example, if the program does not wish to encode the telemetry downlink, then that module can be eliminated from the system without causing any disturbance with other systems or modules. System architecture for the subminiature flight termination system includes a variety of components and modules shown in the graphic below.



The [enhanced flight termination system](#) could be used in conjunction with the subminiature flight termination system. The enhanced flight termination system ground equipment (encoders, monitors, triple data encryption units) encrypts messages and sends them to the command transmitter system, consisting of Legacy modulators, exciters, and high power amplifiers. The command transmitter system relays the enhanced flight termination system messages to the vehicle via the command transmitter. Ultra high frequency antennas pick up the transmitted enhanced flight termination system signals and send them to the flight termination receiver.

From there, the commands are processed and sent to the flight termination controllers for action. The controller then sends a signal to the flight termination system safe and

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arm devices to initiate destruct if termination is necessary. The unit also contains a GPS sensor/receiver that will provide accurate GPS tracking for range ground stations. The telemetry being retrieved from the vehicle will be encrypted within the subminiature flight termination system unit for transmission to range ground stations.

Even though this system is not yet complete, the technology involved and the determination exhibited in making this program succeed are remarkable. Range Safety will continue to work with the subminiature flight safety system program to ensure that the newest, groundbreaking methods and technologies are available for all ranges and users as desired. Range Safety will also continue working with the program to ensure that public safety is a top priority in designing this system.